REMARKS

The Amendments

The amendments do not narrow the scope of the claims and/or were not made for reasons related to patentability. The amendments should not be interpreted as an acquiescence to any objection or rejection made in this application.

To the extent that the amendments avoid the prior art or for other reasons related to patentability, competitors are warned that the amendments are not intended to and do not limit the scope of equivalents which may be asserted on subject matter outside the literal scope of any patented claims but not anticipated or rendered obvious by the prior art or otherwise unpatentable to applicants. Applicants reserve the right to file one or more continuing and/or divisional applications directed to any subject matter disclosed in the application which has been canceled by any of the above amendments.

The Priority Document

The Office Action indicates that applicants have not filed a certified copy of the Japanese priority document. However, this application is a US National Phase application from a PCT International application. Attached is Form PCT/IB/304 from the PCT International Bureau indicating that the priority document for this application was submitted to the International Bureau in compliance with Rule 17.1(a) or (b). This submission fulfills applicants' duties in providing a certified copy of the priority document.

The Information Disclosure Statement

In accordance with the request in the Office Action, attached is a copy of the search report for the corresponding PCT application and a PTO Form-1449 listing the references

cited therein. The Office Action indicates that these references have already been considered. The references should be included the "References Cited" listing of any subsequent patent.

The Objection for Absence of Drawings

Applicants respectfully disagree that the claimed subject matter admits of the need for drawings in order to understand the invention. The claims are method claims and thus the invention is defined by the methods steps conducted. Such subject matter is not normally considered as requiring a drawing, see, e.g., M.P.E.P. § 608.02, entry (A) under the heading "HANDLING OF DRAWING REQUIREMENTS UNDER THE FIRST SENTENCE OF 35 U.S.C. 113" indicating the drawings are not normally required when "(A) at least one process claim including the term "process" or "method" in its introductory phrase." The instant claims are such claims and the requirement for drawings here should be withdrawn.

That being said, in fact, this application was intended to have drawings (as is clear from the descriptions thereof in the specification). These drawings are in the PCT application from which this US National Phase application stems and those drawings are now properly added to the specification. Since the US National Phase application is, by definition, an identical copy (or translation) of the PCT, these drawings properly belong in this application.

The Objections to the Specification

To address the objections to the specification, applicants are submitting a substitute specification. The substitute specification is provided in both a clean form, as amended, and in a marked-up form showing the amendments made. No new matter is introduced by these amendments. As surmised in the Office Action, the point where the specification does not conform to U.S. grammar and practice arose through a direct translation from the original

Japanese. Its modification is believed to be obvious when taken in context with the disclosure and the knowledge of one of ordinary skill in the art. It is believed that the amendments clearly render the objections to the specification moot but the following comments are provided on some specific points raised in the Office Action. (References to page/lines of the specification below will be to the original specification.)

The original specification does contain page numbers at the top of each page.

The disclosure at page 2, lines 25-26, that "unique determination of the phases $\phi(h,k,l)$ cannot be made thereby," i.e., by the previously used diffraction methods, is not in contradiction to the later statements regarding the phases such as by the Direct Method. As the specification states (see, e.g., page 2, lines 2-4), by the previous methods, the "phases of the structure factors are estimated using some method." As discussed below regarding the cited prior art, the Direct Method and previously known methods make an initial estimation or inference of the phases of the structure factors and proceed by trial and error rather than making an actual "determination" or measurement of the phases.

One of ordinary skill in the art would know the meaning of the term "TEXT" file in this art as describing a structure-factor-data-set which is diffraction information obtained by applying a Fourier transformation to an electron microscope image.

The term "accordingly" at page 8, line 17, is believed to be proper. In this context it is used to describe activity which follows based on what was previously described. This is a proper use of the term. Similarly, the word "conferring" in this paragraph is also believed to be properly used. The verb "confer" does describe an operation, i.e., it means to bestow upon the object in question. One of ordinary skill in the art would know that, in this context, phase extension is performed by conferring, i.e., bestowing or assigning, subsequent phases, i.e., the latter, based on those already determined, i.e., the former.

There is no sentence at page 10, lines 24-26, and applicants assume page 9, lines 24-26, was intended. The sentence has been modified to reflect its obvious meaning.

The Rejection Under 35 U.S.C. § 112, First Paragraph

The rejection of claim 1 under 35 U.S.C. § 112, first paragraph, is respectfully traversed.

As discussed above, one of ordinary skill in the art knows what is meant by the term "Text file" in the context of the relevant art area of this invention. That is, it is a structure-factor-data-set which is diffraction information obtained by applying a Fourier transformation to an electron microscope image.

Further, based on the description in applicants' disclosure and their knowledge of the art, one of ordinary skill in the art is informed on how to use such information to determine the phases of the diffracted waves which are then used in determining the structure of the material. The disclosure, for example, at page 3, lines 21-27; and page 6, line 10, to page 7, line 19; describes the parameters and means by which the Fourier transform data can be used in a unique way to determine the phases – and other information for the structure determination.

This description read by one of ordinary skill in the art informs the following procedures to make the determination. The density distribution of a substance can mathematically be described by superimposing density modulation waves. The wave can be specified, if the amplitude and phase are determined in a coordinate system with a specified origin. As the phase is a function of the coordinates of origin, a meaningful discussion can be made only when this is specified. According to the invention, amplitude and phase (which are together defined as crystal structural factors) are calculated respectively for the number of

waves required to describe the structure of the soft material. The diffraction intensity is the square of the amplitude of the crystal structure factors. The product of applying a Fourier transformation to the observed high resolution electron microscope image is referred to as a Fourier diffractogram. One of the Fourier diffractograms according to this invention (see claim 1 reciting "a plurality of crystallographically significant directions are selected in succession as incident axes of electrons") passes through the origin of the three-dimensional density distribution of the substance and gives a two-dimensional density distribution projected to a plane perpendicular to the incidence direction. Therefore, according to this invention, electron beams are arranged to be incident from plural directions with the condition that they are aligned with the zone axes, and high resolution electron microscope images are observed. Next, the repeating unit of the aforesaid substance density is calculated from the Fourier diffractogram of the obtained electron microscope image. Next, the crystal system and its unit cell parameters are calculated from the repeating unit of the substance density of obtained, and space groups are determined based on the appearance frequency (selection rule, corresponding to the extinction rule in crystallography) of the diffraction mottle. Here, the space groups are determined using also the symmetry and point groups of the crystal morphology. In particular, in systems having a center of symmetry, in the aforesaid high resolution electron microscope image incident from plural directions along the zone axes, a position corresponding to an identical center of symmetry can be found. Thus, a coordinate system having this point as a common origin is selected, and three-dimensional crystal-structure-factor data set can be generated from the two-dimensional diffraction information data obtained from these respective axial incidences by calculating the phase of the electron micrograph in the selected coordinate system.

Identification such as this of the type of data used, the parameters and the assumptions that can be made provide one of ordinary skill in the art with adequate information from which to determine the phases.

Contrary to the implication in the Office Action that the "diffracted waves" recited in the specification as used for such determination are unknown, one of ordinary skill in the art knows that the diffracted waves are the components of the diffraction pattern shown in the electron microscopy images.

Applicants did not state in their disclosure that determining the phases was impossible. They stated that the determination of the phases could not be done using the previous methods. Only based on the parameters described by applicants and the special properties of the soft materials measured is such determination possible by direct measurement. The significance of the unique properties of the soft materials to the ability to determine the phases is part of applicants' invention and contribution to the art. Such significance was not previously recognized. As pointed out in the Office Action, the prior art cited in the rejection confirms the prejudice in the art that direct measurement of the phases could not be made using those previous methods; see, e.g., col. 2, lines 14-17, of Subbiah '456. The webpage sight similarly discloses use of the so-called "Direct Method" which is not direct at all but is a trial and error method requiring making initial estimates, or guesses, and working back to see if the data will match.

Accordingly, it is urged that the rejection under 35 U.S.C. § 112, first paragraph, should be withdrawn.

The Rejections Under 35 U.S.C. § 112, Second Paragraph

The two rejections of claim 1 under 35 U.S.C. § 112, second paragraph, are respectfully traversed.

As to the first rejection, it is discussed above that one of ordinary skill in the art would, based on the discoveries described in applicants' specification, know how to use the data in order to make the evaluation of the amplitudes and phases, and subsequently the structure of the soft material. The specification taken with the knowledge of one of ordinary skill in the art at the time of the invention gives sufficient guidance for making these evaluations.

As to the second rejection, original claim 1 specifically set forth that Fourier transforming is done on the transmission electron microscopy (TEM) images. Claim 1 has been amended for clarity purposes that the Fourier transform is done on the electronic data generated from the TEM images and should even more clearly point this out. Applicants do not believe the specification uses the term "Fourier diffraction pattern" incorrectly. The Fourier transform of the data from the TEM images is representative of a diffraction pattern, hence a "Fourier diffraction pattern" is just a term clearly describing a diffraction pattern in electronic data form obtained by Fourier transform of TEM image data.

For the above reasons, it is urged that the rejections under 35 U.S.C. § 112, second paragraph, should be withdrawn.

The Rejection Under 35 U.S.C. § 102

The rejection of claims 1 and 2 under 35 U.S.C. § 102(b), as being anticipated by Dorset ("Trends In Polymer Sciences" article) is respectfully traversed.

Dorset fails to describe unique determination of an atomic position and a surrounding molecular distribution inside a unit cell (hereafter, density distribution), which is the minimum unit describing a soft material, from TEM images without assuming a structural model.

Dorset arrives at amplitudes and phases, and thus structure, from the electron diffraction patterns by the so-called "Direct method." Contrary to its moniker, the "Direct method" does not directly determine the phase values. As more clearly described in the "Introduction" section of the "http://www.numis.nwu.edu/fs98" website cited in the Office Action, the Direct method involves making an initial guess, or educated guess, at a model for the structure and seeing if the data fits that guess and, if it does not, refining the guesses through multiple cycles until a model is found which the data fits. While certainly much goes in to selecting good models and refining them based on their applicability, the Direct method is, at its core, a type of trial and error method. Dorset's disclosure is directed to the use of such trial and error methods; see, e.g., the bottom of the left-hand column of page 213 through the top of the left-hand column of page 214 and Cases 1-4 each of which begin with estimating a model and trying to fit the data with a model.

Dorset's methods does not involve determining the phase of the diffraction spots from the Fourier transformed data of the electron microscope image directly, i.e., by experiment and without assuming a model beforehand. Thus, Dorset does not anticipate the instant claims and the rejection under 35 U.S.C. § 102 should be withdrawn. Further, Dorset does not suggest the claimed method and would not support a 35 U.S.C. § 103 rejection either.

The Rejections Under 35 U.S.C. § 103

The rejections of claim 3 and of claims 4-6 under 35 U.S.C. § 103, as being obvious over Dorset in view of Anderson (US Pub. 2002/0102674) or further in view of Subbiah (US Pat. 5,365,456) are respectfully traversed.

Dorset is discussed above and that discussion is incorporated herein by reference. Anderson and Subbiah do not make up for the above-discussed deficiencies of Dorset or suggest modification of Dorset to arrive at the claimed invention.

Regarding the microporous membrane material, Anderson:

- estimates the crystal class, e.g., cubic, from X-ray small angle scattering,
- confirms the three-fold axis from the [111] incidence TEM image, and
- shows how to assess the suitability of the structural model by comparing the expected image with the aforesaid estimated structural model.

Thus, Anderson also assumes structural models and selects the most suitable solution from plural models on the basis of their matching. Anderson does not uniquely determine the structure as a logical solution from the experimental analysis without assuming a structural model. The combined teachings of Dorset and Anderson do not suggest applicants' claimed invention.

Subbiah also fails to make up for the above-discussed deficiencies of Dorset and Anderson or suggest modification of Dorset or Anderson to arrive at the claimed invention. Contrary to suggesting a method involving direct experimental determination of the phases, Subbiah confirms that methods were not known for measuring the phases directly by experimentation; col. 2, lines 14-17. Subbiah refers to the direct method and, incorrectly, states that it involves direct calculation of the phases; col. 2, lines 22-31. Subbiah's method involves no calculation, of any kind, of the phases; col. 4, lines 14-17.

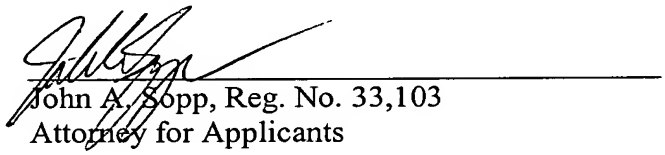
Accordingly, Subbiah does not teach or suggest uniquely determining the structure as a logical solution from experimental analysis without assuming a structural model and the combined teachings of Subbiah with Dorset and/or Anderson do not suggest applicants' claimed invention.

For all of the above reasons, the rejections under 35 U.S.C. § 103 should be withdrawn.

It is submitted that the claims are in condition for allowance. However, the Examiner is kindly invited to contact the undersigned to discuss any unresolved matters.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,



John A. Sopp, Reg. No. 33,103
Attorney for Applicants

MILLEN, WHITE, ZELANO &
BRANIGAN, P.C.
Arlington Courthouse Plaza 1, Suite 1400
2200 Clarendon Boulevard
Arlington, Virginia 22201
Telephone: (703) 243-6333
Facsimile: (703) 243-6410

Attorney Docket No.: TAKIT-163

Date: February 24, 2003

K:\takit\163\Reply to OA 10-24-02.doc

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE DRAWINGS:

Drawing Figures 1-4 have been attached to the specification.

IN THE SPECIFICATION:

The Specification in its entirety has been replaced with the attached new Substitute Specification. The substitute specification contains the original claims but amendments to the claims are provided below.

IN THE CLAIMS:

Claims 1 and 6 have been amended to read as follows:

1. **(Amended)** A method of determining a soft material structure, ~~characterized in that the soft material structure is determined by~~ comprising:

taking transmission electron microscopy images of a soft material under conditions that a plurality of crystallographically significant directions are selected in succession as incident axes of electrons,

converting the images to data in electronic form,

Fourier transforming the data generated from each of the images ~~photographed~~,

~~evaluating therefrom~~ determining directly from the Fourier-transformed data the amplitudes and phases of three-dimensional crystal structure factors, the phases being directly determined assuming weak topological object approximation,

~~and further~~ performing inverse Fourier transforms ~~by use of the values evaluated~~ using the determined amplitudes and phases, and

determining the structure of the soft material therefrom.

6. **(Amended)** A method of determining a soft material structure as described in claim 1, wherein the images used to provide the data for Fourier transform are partial areas of images corresponding to no greater than 50 nm-thick parts of a sample of the soft material.

Claims 7 and 8 have been added.